義隆電子股份有限公司
ELAN MICROELECTRONICS CORP.

ICE567
User manual

FOR
EM78565
EM78566
EM78567

Version 1.0

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EM78P567/566/565 Manual

EM78R567 SPEC.

Pin Configuration

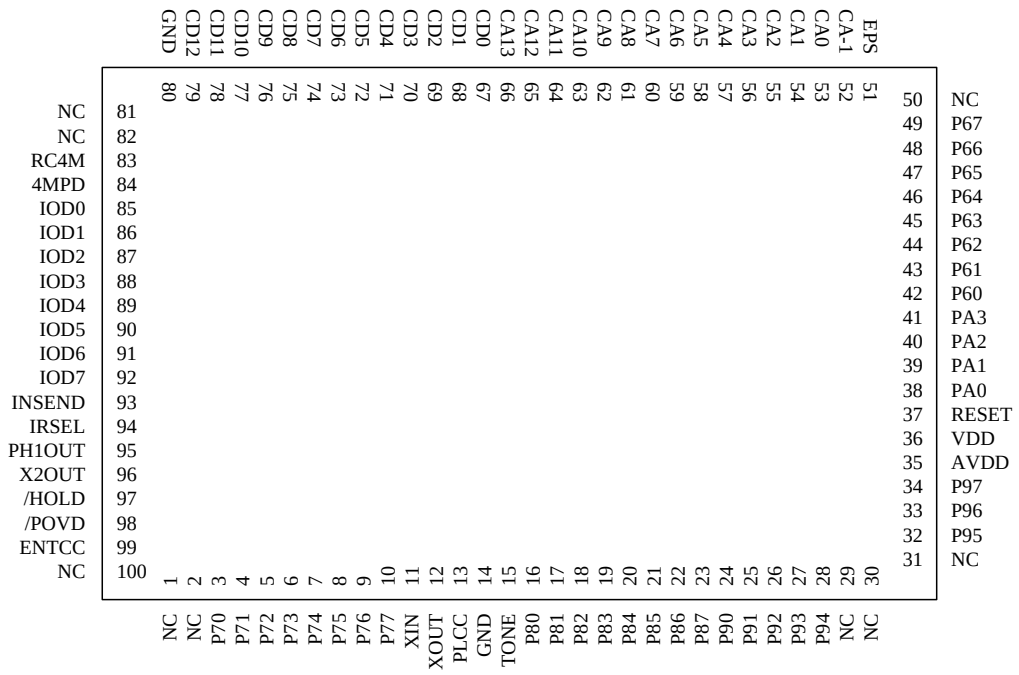


Fig1. Pin Assignment

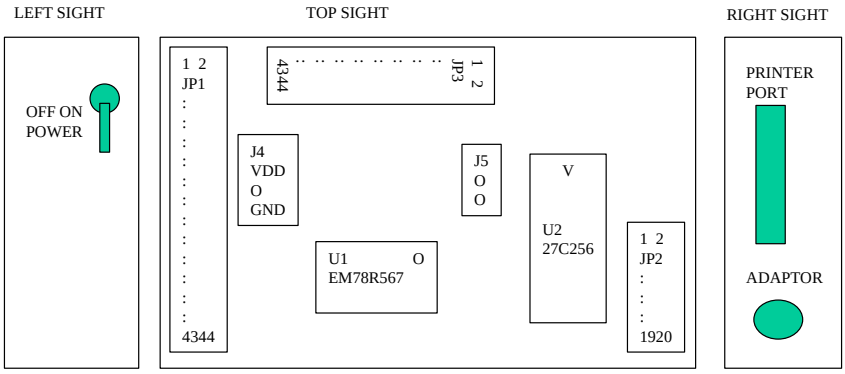
Pin Descriptions

PIN	I/O	DESCRIPTION
VDD	POWER	power
GND	POWER	ground
Xin	I	Input pin for 32.768 kHz oscillator
Xout	O	Output pin for 32.768 kHz oscillator
PLLC	I	Phase loop lock capacitor, connect a capacitor 0.01u to 0.047u with GND .
INT0 INT1 INT2 INT3 INT4 INT5	PORT7(0) PORT7(1) PORT7(2) PORT7(3) PORT7(4) PORT7(5)	External interrupt

INT6 INT7	PORT7(6) PORT7(7)	
P7.0 ~P7.7	PORT7	PORT 7 can be INPUT or OUTPUT port each bit. Internal Pull high function.
P6.0 ~P6.7	PORT6	PORT 6 can be INPUT or OUTPUT port each bit. Internal Pull high function.
P8.0 ~P8.7	PORT8	PORT 8 can be INPUT or OUTPUT port each bit.
P9.0 ~P9.7	PORT9	PORT 9 can be INPUT or OUTPUT port each bit. P90 to P93 have Open drain function.
VREF	P9(4)	Reference voltage input of AD converter-circuit . User use internal reference voltage. This pin is normal IO PORT.
AD1	P9(5)	The first input of A/D converter.
AD2	P9(6)	The second input of A/D converter.
AD3	P9(7)	The third input of A/D converter.
PA.0 ~PA.3	PORTA	PORTA can be INPUT or OUTPUT port each bit.
TEST	I	Test pin can control the chip to test mode or normal mode. Normally set to low.
DTMF	O	DTMF tone output
RESET	I	Normally high

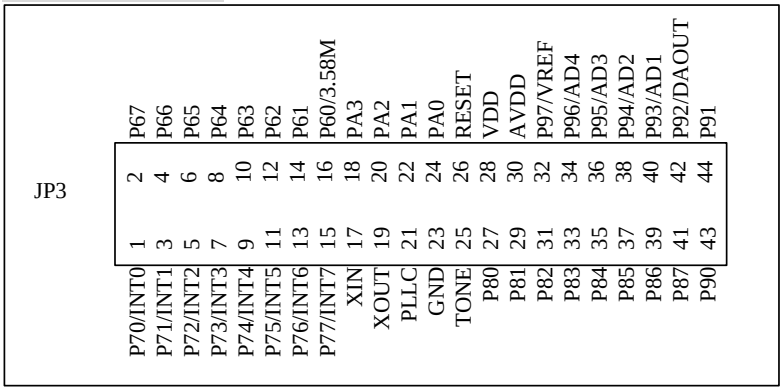
X2OUT	O	System clock output.
CA-1	O	CA-1 is used as address line to select low-order data (8 bits, through CD0~CD7) or high-order data (5 bits, through CD0~CD4) ERS=1 => CA-1 NO USE ERS=0 => CA-1=0 HIGH ORDER DATA CA-1=1 LOW ORDER DATA
EPS	I	Input pin used to select the external ROM data bus through bus CD0~D12 or CD0~CD7 only. HIGH/LOW = CD0~CD12 / CD0~CD7.
ENTCC	I	TCC control pin with **internal pull-high (560KΩ).** TCC works normally when ENTCC is high, and TCC counting is stopped when ENTCC is low.
CA0~CA13	O	Program code address bus. CA0~CA13 are address output pins for external programming ROM access.
CD0~CD12	I	Data access in terms of CA0 ~ CA12 addressing.
IRSEL	O	IRSEL is an output pin used to select an external EVEN/ODD ROM.
INSEND	O	Used to indicate the instruction completion and ready for next instruction.
/HOLD	I	Controller hold request.
/POVD	I	Input pin used to enable Power on voltage detector with **internal pull-high (560KΩ).**. Power on voltage detector is enabled if /POVD is low and is disabled if /POVD is high.
IOD0~IOD7	O	I/O data bus.
PH1OUT	O	Phase 1 output
RC4M	O	RC clock 3MHz output
4MPD	I	3MHz RC power control pin. VDD/GND = disable/enable internal pull low.

ICE TOP VIEW

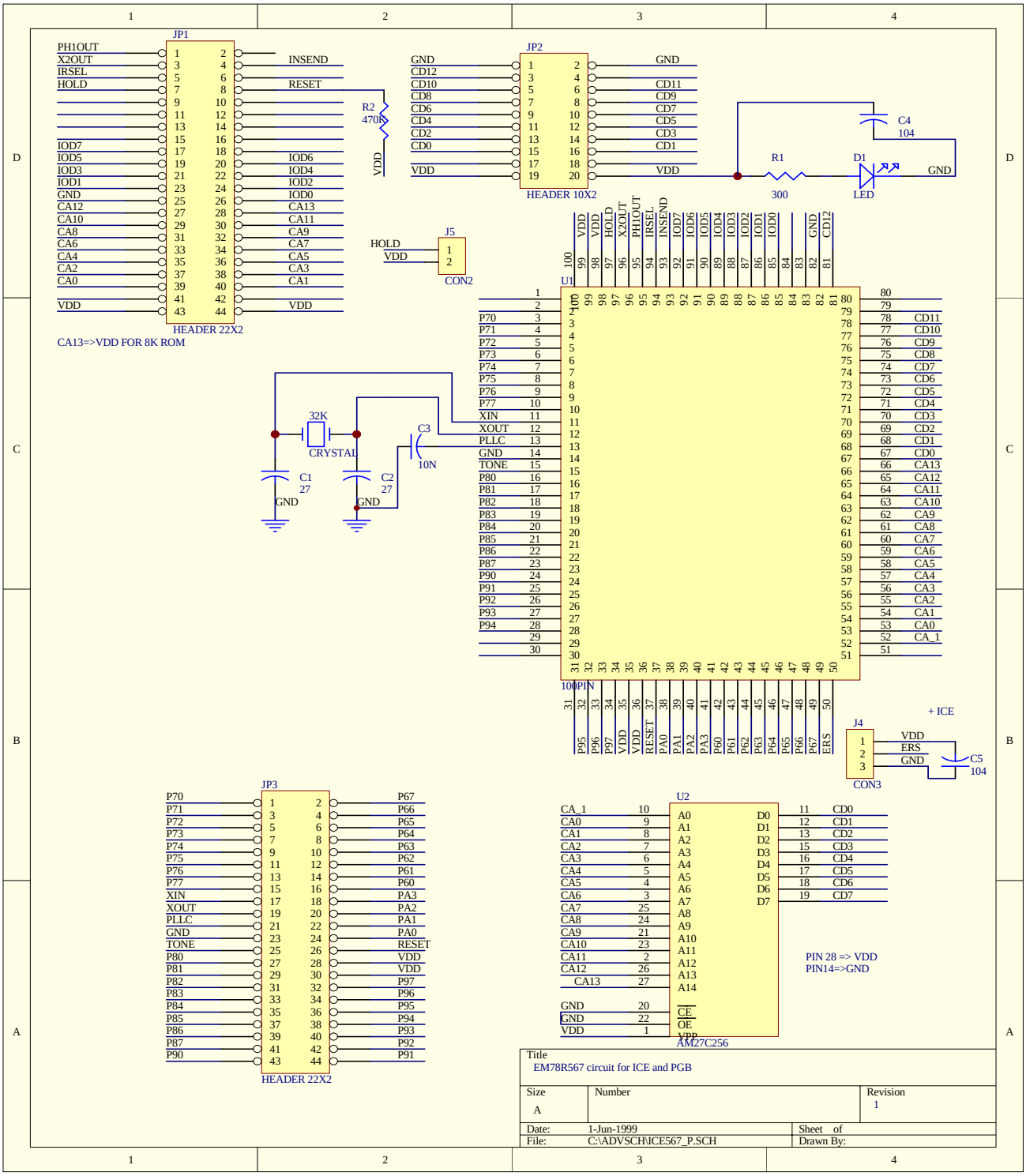


1. Installation must be Authorized by EMC.
2. Power on the E8 ICE before executing the control software, or an error message due to lack of hardware will appear.
3. E8 - ICE uses the printer port to communicate with host PC. If a user wants to use the printer, it is recommended to install another printer port.
4. Power on switch located on the left side of ICE box. By switching left or right side to turn off or turn on the ICE power.
5. Printer port and the adapter locate on the right side. The ICE connects to personal computer by printer port. The adapter connects to the power. Be sure turn power off of ICE before plug in the adapter for avoiding over current which may be burn the chip off.
6. On the top sight, we have three connections and one EM78567 romless chip and some switches. The JP1 and the JP2 connect to the second layer of ICE for the code instruction accessing. The JP3 is more important for ICE user. They are the EM78567 control signal and I/O ports. ICE user can connect these connections to user's application board. The connections are list below.
7. The U1 is EM78567 romless chip. The U2 is a 32K bytes ROM for on board testing one day by piggyback. If user have developed application code by this ICE. User can use PIGGYBACK (user can buy from EMC) to connect to user's application board with 32 bytes EPROM . To verify user's program.
8. ICE setup. (1) J5 open (2)J4 connect VDD
9. PIGGYBACK setup. (1)J5 short (2)J4 connect to GND (3)U2=> 32k byte EPROM.(USER CAN USE FILE "*.MIX" WHICH GENERATED BY WICE PIGGYBACK function.)
10. Run WICE.exe

JP3 connection



ICE CIRCUIT


JP1
HEADER 22X2
CA13=>VDD FOR 8K ROM
JP2
HEADER 10X2
R1
300
R2
470K
C4
104
D1
LED
J5
CON2
U1
100PIN
32K
CRYSTAL
C1
27
C2
27
C3
10N
J4
CON3
+ ICE
C5
104
JP3
HEADER 22X2
U2
AM27C256
PIN 28 => VDD
PIN14=>GND
Title
EM78R567 circuit for ICE and PGB
Size
A
Number
Revision
1
Date: 1-Jun-1999
File: C:\ADVSCH\ICE567_P.SCH
Sheet of
Drawn By:

TEST PROGRAM

ROM PAGE TEST

```
;=============================================|
;16K ROM PAGE JUMPING TEST                    |
;
;AND    "PAGE " INSTRUCTION TEST
;
;IT WILL SHOW    PAGE NUMBER AT PORT9 WITH
; ONE PAGE ONE PULSE
;=============================================|
ROM_R ==    0X05
DELAY ==    0X06
PORT9 == 0X09
PORT8    == 0X08
PORT7    == 0X07
PORT6    == 0X06

        ORG 0X000
        NOP
        MOV         A,@0XFF
        XOR         PORT9,A
        BC          0X0A,6          ;PLL
        JMP         START
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
START:
        CLRA
        IOW             0X06
        IOW             0X07
        IOW             0X08
        IOW         0X09
        IOW             0X0A
;===================================
PAGE0:
        MOV         A,@0XFF
        XOR         PORT8,A
        XOR         PORT9,A
        XOR         PORT9,A
        PAGE        @0
        CALL        DELAY1
        PAGE        12      ;PAGE INSTRUCTION TEST
        PAGE        1
        PAGE        10
        PAGE        14
        PAGE        6
```

```
        PAGE    @0X07
        PAGE    2
        PAGE    0
        MOV     A,@0X00
        IOW     PORT7
        IOW     PORT6
        IOW     PORT8
        IOW     PORT9

        MOV     A,@0XFF
        XOR     PORT7,A
        MOV     A,@0XFF
        XOR     PORT6,A
        MOV     A,@0XFF
        XOR     PORT8,A
        MOV     A,@0XFF
        XOR     PORT8,A

        NOP
        NOP

        PAGE    @1
        JMP     PAGE1
;=============================================
DELAY1          NOP             ;FOR DELAY
        MOV     0X1C,A      ;
        L1      CALL DELAY11    ;
        DJZ     0X1C        ;
        JMP     L1          ;
        RET         ;
DELAY11             NOP         ;
        MOV     A,@0X0A     ;
        MOV     0X1D,A      ;
        L11     CALL DELAY111 ;
        DJZ     0X1D        ;
        JMP     L11         ;
        RET         ;
DELAY111        NOP         ;
        MOV     A,@0X3F     ;
        MOV     0X1B,A      ;
        L111    DJZ   0X1B      ;
        JMP     L111        ;
        RET         ;
        EOP         ;END PAGE0
;=============================================

PAGE1:
        NOP
        NOP
        MOV      A,@0XFF
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
```

```
        XOR     PORT9,A
        :
        :
        :
        :
        :

PAGE15:
        NOP
        NOP
        MOV     A,@0XFF
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A

        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A

        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A

        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A

        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A
        XOR     PORT9,A

        XOR     PORT9,A

        PAGE    @0
        CALL    DELAY1

        NOP
```

```
        PAGE    @0
        JMP     PAGE0
;==============================
EOP
```

AD PROGRAM TEST

```
;================================================
;AD CONVERTER TEST
;     CHANNEL 1 AD INPUT (P93 IS THE FIRST AD INPUT)
;
;     SIGNAL SENT TO DA    OUTPUT
;     SO USER CAN SCOPE AT P92(DA OUTPUT)
;     YOU WILL SEE THE DUAL TONE SIGNAL
;
;     PLEASE CONNECT TONE TO P93
;
;================================================
        JMP START
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        ;====INTERRUPTION===BEGIN======
        DISI
        CLR     0X0F                ;CLEAR     ADI
        MOV     A,@0X01
        XOR     0X09,A
        ; XOR    0X0E,A             ;CHANGE AD CHANNEL    IN1<=>IN2
        IOR     0X0D                ;READ     AD DATA
        MOV     0X0B,A              ;WRITE    DA DATA
        ;------------
        BS      0X0E,0X03           ;RESTART AD FOR SAMPLING ANOTHER ONE
        RETI
        ;===END INTERRUPTION==========


;================================
;MAIN PROGRAM
;================================
START:
        CLRA
        IOW     0X07
        IOW     0X08
        IOW     0X0A
        IOW     0X06
        IOW     0X09
```

```
        MOV     0X09,A
        MOV     A,@0XFF
        ;       IOW 0X05                ;P6 PULL HIGH
        ;       IOW   0X0E              ;P7 PULL HIGH
        BS      0X0A,0X06               ;PLL ENABLE
        ;=========================
        ;======TONE SETTING=======
        ;=========================
        BS      0X03,0X06               ;IOCD,IOCE PAGE1
        BS      0X05,4                  ;ENABLE TONE1
        BS      0X05,5                  ;ENABLE TONE2
        ;====== 2 =========
        MOV     A,@160
        IOW     0X0D    ;1
        MOV     A,@84
        IOW     0X0E    ;2
        BC      0X03,0X06               ;IOCD,IOCE PAGE0
        ;======END TONE SETTING=======

        ;================================
        ;----A TO D SETTING ----------
        ;================================
        BC      0X05,7                  ;22K CLOCK SOURCE (00)
        BC      0X05,6
        ;PAGE   @1                      ;PAGE TEST
        ;PAGE   @15
        ;PAGE   @0
        MOV     A,@0B00100000           ;ADI
        IOW     0X0F
        CLR     0X0F
        ENI
        ;=== ;SAD3,SAD2,SAD1,SVREF,START,ADPWR,IN1,IN0==
        MOV     A,@0B01100100       ;SAD3,SAD2,SAD1,SVREF,START,ADPWR,IN1,IN0
        MOV     0X0E,A              ;AD SETTING
        BS      0X0E,0X03           ;START
        ;=====================================================
        ;------D TO A    SETTING----------------------------
        ;=====================================================
        BS      0X03,0X06           ; IOCB PAGE1
        MOV     A,@0B00100000       ;BIT4 P60=>3.58    BIT5 P92=>DA OUT
        IOW     0X0B
        BC      0X03,0X07           ;REFERENCE VOLTAGE    0/1=VDD/2.25
        BS      0X03,0X05           ;START DA    POWER        0/1=STOP/START
        BC      0X03,0X06           ;IOCB PAGE0
        ;-----------------------------------------------
        NOP
        NOP
LOOP:
        NOP
        NOP
        JMP     LOOP
```

DA TEST

```
;============================
;DA CONVERTER TEST
;
;P92 WILL HAS TRIANGLE OUTPUT
;============================
DA_DATA == 125
        JMP         START
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        ;-------
START:
        CLRA
        IOW         0X07
        IOW         0X08
        IOW             0X0A
        IOW         0X06
        IOW             0X09
        MOV         0X09,A
        BS          0X0A,0X06           ;PLL
        ;================================
        ;------DA   SETTING----------------------------
        ;================================
        BS          0X03,0X06           ; IOCB PAGE1
        MOV         A,@0B00110000       ;P60=>3.58     P92=>DA OUT
        IOW         0X0B
        BC          0X03,0X07           ;REFERENCE VOLTAGE    0/1=VDD/2.25
        BS          0X03,0X05           ;START DA    POWER        0/1=STOP/START
        BC          0X03,0X06           ;IOCB PAGE0
        ;-----------------------------------------------
        MOV         A,@DA_DATA
        MOV         0X0B,A              ; DA DATA
        CLR         0X10
LOOP:
        MOV         A,0X10
        MOV         0X0B,A
        NOP
        NOP
        NOP
        INC         0X10
        JMP         LOOP
        ;================================
```

```
    EOP
```

COUNTER1 TEST

```
;================================================
;COUNTER1 INTURREPT TEST
;
;========COUNTER1 SETTING=========
;1.PAGE1=>0X03 BIT6                |
;2.SET PRESCALER=>IOCB    PAGE1
;3.SOURCE 32KHZ OR 3.58MHZ=>IOCB PAGE1|
;4.COUNTER1 INITIAL VALUE =>IOCB PAGE0|
;5.SET INT TO BIT1 =>IOCF
;6.CLEAR RF
;7.INTURREPT ENABLE=>ENI
;
;================================================
CNT1 == 0X0B
A_BUFFER == 0X10
R5_BUFFER == 0X11
R3_BUFFER == 0X12
    JMP     START
    NOP
    NOP
    NOP
    NOP
    NOP
    NOP
    NOP
    NOP
    NOP
    ;======================
    ;===INTERRUPT BEGIN==
    ;======================
    DISI                        ;DISABLE INTURREPT
    MOV     A_BUFFER,A          ;} SAVE ACC
    SWAP    A_BUFFER            ;}
    MOV     A,0X03              ;} SAVE STATUS
    MOV     R3_BUFFER,A         ;}
    MOV     A,0X05              ;} SAVE PAGE
    MOV     R5_BUFFER,A         ;}
    CLR         0X0F                ;CLEAR RF
    MOV     A,@0XFF             ;TOGGLE PORT9
    XOR         0X09,A
    MOV     A,R5_BUFFER         ;} RETURN PAGE
    MOV     0X05,A              ;}
    MOV     A,R3_BUFFER         ;} RETURN STATUS
    MOV     0X03,A              ;}
    SWAPA   A_BUFFER           ;} RETURN ACC
    RETI
```

```
      ;=====================================
      ;======END INTERRUPTION================
      ;=====================================

START         NOP
      BC      0X0A,0X06           ;ENABLE PLL    3.68MHZ
      MOV     A,@0XFF
      CLRA
      IOW           0X06      ;
      IOW           0X07      ;
      IOW           0X08      ;
      IOW           0X09      ;
      IOW           0X0A      ;
      ;================================
      ;======COUNTER1 SETTING=========
      ;================================
      BS      0X03,0X06     ;PAGE1
      MOV     A,@0X03   ;16.38KHZ     1:16    250MS
      ;       MOV A,@0X04   ;16.38KHZ     1:32    500MS
      ;       MOV A,@0X05   ;16.38KHZ     1:64    1000MS
      ;       MOV A,@0X06   ;16.38KHZ     1:128   2000MS
      ;       MOV A,@0X07   ;16.38KHZ     1:256   4000MS
      ;-----------------------------------------------
      ;       MOV A,@0X0D   ;3.58MHZ CLOCK     ,1:64      4.576MS    IF PLL ENABLED
      ;       MOV A,@0X0E   ;3.58MHZ CLOCK     ,1:128     9.153MS    IF PLL ENABLED
      ;       MOV A,@0X0F   ;3.58MHZ CLOCK     ,1:256     18,3MS     IF PLL ENABLED
      IOW           CNT1      ;SOURCE 32KHZ
      ;================================
      BC      0X03,0X06   ;IOCB PAGE0
      MOV     A,@0X00   ;COUNTER2 INITIAL VALUE          |
      IOW           CNT1      ;
      MOV     A,@0B00000010   ;SET INT TO BIT1
      IOW           0X0F      ;IOCF
      CLR           0X0F      ;CLEAR RF
      ENI     ;INTURREPT ENABLE
      ;================================
      ;=======WAIT FOR INTURREPT======
      ;================================
LOOP          NOP
      NOP
      NOP
      JMP     LOOP
      EOP
      ;=============================================================================
```

TCC TEST

```
;================================================
;TCC TEST IN IDLE MODE
;
;   PORT9 WILL TOGGLE EVERY INTERRUPTION
```

```
;================================================
PLL         == 0X06
RF          == 0X0F
TCIF        == 0X00

        TCC             == 1
        JMP         START
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        NOP
        ;================================================
        ;==========INTERRUPTION BEGIN==================
        ;================================================
        DISI                ;DISABLE INTURREPT
        CLR         0X0F            ;CLEAR RF
        MOV         A,@0XFF
        XOR         0X09,A          ;TOGGLE
        RETI
        ;================================================
START           CLRA
        IOW         0X06
        IOW         0X07
        IOW         0X08
        IOW         0X09
        IOW         0X0A
        BC          0X0A,0X06;ENABLE PLL    3.68MHZ
        BS          0X0A,0X07;IDLE    1/0=IDLE/SLEEP MODE
        MOV         A,@0X00
        IOW             0X09        ;PORT9 OUTPUT
        ;================================
        ;======TCC SETTING==============
        ;================================
        ;           MOV A,@0X00   ;3.68MHZ CLOCK     ,1:2     .28MS
        ;           MOV A,@0X01   ;3.68KHZ CLOCK     ,1:4     .56MS
        ;           MOV A,@0X03   ;3.68KHZ CLOCK     ,1:16    2.2MS
        MOV         A,@0X20         ;16.3KHZ CLOCK     ,1:2     0.031S |
        ;           MOV A,@0X23   ;16.3KHZ CLOCK     ,1:16    0.25S
        ;           MOV A,@0X24   ;16.3KHZ CLOCK     ,1:32    0.5S
        ;           MOV A,@0X25   ;16.3KHZ CLOCK     ,1:64    1.0S
        ;           MOV A,@0X26   ;16.3KHZ CLOCK     ,1:128 2.0S
        CONTW               ;WRITE TO CONTROL REGISTER
        MOV         A,@0X01   ;SET INT TO BIT0
        IOW         0X0F        ;IOCF
        CLR             0X0F        ;CLEAR RF
        MOV         A,@0X00   ;
        MOV         TCC,A       ;TCC INITIAL VALUE
        ENI                     ;INTURREPT ENABLE
```

```
        NOP                     ;==============================
        ;=================================================
LOOP:
        SLEP            ;IDLE MODE
        NOP
        NOP
        NOP
        JMP         LOOP
        ;------------------------------

        EOP
```

TONE TEST

```
;=====================================
;TONE    TEST
;SCOPE TONE    OUTPUT
;
;IT WILL OUTPUT DUAL TONE FROM 1 TO *
;=====================================
        JMP         START
        NOP
        NOP
        NOP
        ;=====================================
START           NOP
        CLRA
        IOW         0X06
        IOW         0X07
        IOW         0X08
        IOW         0X0A
        IOW             0X09
        MOV         0X09,A
        BS          0X0A,0X06    ;PLL
        ;--------TONE SETTING---
        BS          0X03,0X06    ;IOCD,IOCE PAGE1
        BS          0X05,4       ;TONE1
        BS          0X05,5    ;TONE2
;; ====== 1
        MOV         A,@160
        IOW         0X0D     ;1
        MOV         A,@93
        IOW         0X0E    ;2
        CALL        DELAY2
;; ====== 2
        MOV         A,@160
        IOW         0X0D     ;1
        MOV         A,@84
        IOW         0X0E    ;2
        CALL        DELAY2
;; ====== 3
        MOV         A,@160
```

```
        IOW     0X0D    ;1
        MOV     A,@76
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== A
        MOV     A,@160
        IOW     0X0D    ;1
        MOV     A,@68
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 4
        MOV     A,@145
        IOW     0X0D    ;1
        MOV     A,@93
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 5
        MOV     A,@145
        IOW     0X0D    ;1
        MOV     A,@84
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 6
        MOV     A,@145
        IOW     0X0D    ;1
        MOV     A,@76
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== B
        MOV     A,@145
        IOW     0X0D    ;1
        MOV     A,@68
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 7
        MOV     A,@131
        IOW     0X0D    ;1
        MOV     A,@93
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 8
        MOV     A,@131
        IOW     0X0D    ;1
        MOV     A,@84
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 9
        MOV     A,@131
        IOW     0X0D    ;1
        MOV     A,@76
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== C
```

```
        MOV     A,@131
        IOW     0X0D    ;1
        MOV     A,@68
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== *
        MOV     A,@119
        IOW     0X0D    ;1
        MOV     A,@93
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== 0
        MOV     A,@119
        IOW     0X0D    ;1
        MOV     A,@84
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== #
        MOV     A,@119
        IOW     0X0D    ;1
        MOV      A,@76
        IOW     0X0E    ;2
        CALL    DELAY2
;; ====== D
        MOV     A,@119
        IOW     0X0D    ;1
        MOV     A,@68
        IOW     0X0E    ;2
        CALL    DELAY2
        JMP     START

        ;=======================================
DELAY2:
        MOV A,@0XFF
        MOV 0X1C,A
L2    NOP;  CALL DELAY22
        DJZ   0X1C
        JMP   L2
        RET
        ;=======================================
        EOP
```